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Industry and the Environment in Ten Asian Countries: Synthesis Report of US-AEP Country Assessments

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Acronyms

BAPEDAL	Indonesian environmental agency
BAPPENAS	Indonesian central planning agency
BOD	Biological oxygen demand
CFC	Chlorofluorocarbon
DIW	Thailand Department of Industrial Works
DOE	Singapore Department of the Environment
EDB	Singapore Economic Development Board
EMS	Environmental Management System
ENV	Singapore Ministry of Environment
FTI	Federation of Thai Industries
IDB	Taiwan Industrial Development Board
ISO	International Organization for Standardization
ITRI	Industrial Technology Research Institute
JTC	Jurong Town Corporation
KAITECH	Korea Academy of Industrial Technology
KOAMI	Korea Association of Machinery Industry
MIDA	Malaysia Industrial Development Authority
MOFE	Korean Ministry of Finance and Economics
MOIT	Indonesia or Thailand Ministry of Industry and Trade
MOSTE	Thailand Ministry of Science, Technology, and the Environment
MOTIE	Korean Ministry of Trade, Industry, and Energy

NEQA	Thailand National Environmental Quality Act
NIMBY	Not in my backyard
NGO	Nongovernmental organization
NIC	Newly industrializing economies
OECD	Organization for Economic Cooperation and Development
PCD	Thailand Pollution Control Department
PROPER	Program for Pollution Control, Evaluation, and Rating
PSI	Pollution Standards Index
R&D	Research and development
RIET	Regional Institute of Environmental Technology
SISER	Singapore Institute of Standards and Industrial Research
SIRIM	Standards and Industrial Research Institute of Malaysia
SPSB	Singapore Productivity Standards Board
TC	ISO 14000 Technical Committee 207
TEI	Thailand Environment Institute
TEPA	Taiwan Environmental Protection Agency
TISI	Thailand Industrial Standards Institute
US-AEP	United States-Asia Environmental Partnership
USEPA	United States Environmental Protection Agency
WTO	World Trade Organization

Executive Summary

For the last fifteen years (1980–95), economic development in Asia has been little short of astonishing. While the rest of the developing world was experiencing a debt crisis and negative economic growth, economies in Asia boomed and average incomes doubled. Equally astonishing, high growth in Asia, particularly in the newly industrializing economies (NICs) in East Asia, was coupled with low income inequality and rapid declines in the incidence of poverty. This experience convincingly demonstrates that not all growth is inequitable; nor need it bypass the poor.

But broadly based growth in Asia has come at great expense to the environment. Forests are disappearing at alarming rates, marginal land is rapidly being degraded, and intense pressures are being placed on arable land. Pollution loads attending urbanization and industrialization also are rising rapidly. Water pollution, especially that brought on by high organic pollution loads, is a serious problem almost everywhere. Rapid shifts in industrial structure have contributed to significant increases in the toxicity of industrial effluents. Handling and treating this hazardous and toxic waste is everywhere inadequate. The high-energy intensity of industrial growth, reliance of some countries on coal, and high transport densities in Asia's mega-cities all contribute to an equally serious air pollution problem.

This stark contrast between high-growth Asia's successful economic development and rapidly deteriorating environments, particularly urban-industrial environments, makes this region the foremost test of sustainable development. Because others are trying to emulate this economic success, particularly with exports of manufactures, success in reducing the pollution intensity and resource-use intensity of industrial development there may offer invaluable lessons for others.

This raises a critical question: How might a broadly gauged United States-Asia Environmental Partnership (US-AEP) program contribute to reductions in the pollution intensity and resource-use intensity of industrial production? Answering these questions requires knowing more about the nature of industry-environment interactions in high-growth Asia. Because of this, the US-AEP Secretariat asked a small multidisciplinary team to look closely at those interactions in ten Asian countries—four first-tier NICs (Hong Kong, Singapore, South Korea, and Taiwan), three second-tier NICs (Indonesia, Malaysia, and Thailand), and three historically slower growers (India, the Philippines, and Sri Lanka).

Examination of industry-environment interactions in the ten Asian countries focused on identifying and assessing the probable impact of those forces (government policies and pressures from community and nongovernmental organizations [NGOs] and emerging environmental markets) thought most likely to influence the environmental behavior of manufacturing firms. Study methodology consisted of in-depth interviews and literature reviews. Because of this, findings reported here are indicative rather than definitive. They convey a broad sense of what is happening, rather than rigorous analysis of the links among government policy, community actions, and market pressures on the polluting behavior of manufacturing firms.

Findings

What did the assessment teams find? The short answer is: much more than expected. Virtually everywhere assessment teams went, they found substantial evidence of public and private sector actions designed to affect the environmental behavior of manufacturing firms. Virtually everywhere, governments have built or are building traditional command and control environmental agencies. More important, these agencies are experimenting with a wide range of market-based and reputational incentive programs. But environmental actions neither start nor stop with the activities of traditional environmental agencies. Central planning agencies, ministries of industry, science and technology institutes, and national standards agencies are all more or less involved in mainstreaming environmental considerations into economic and industrial policies. Sometimes, this is a direct consequence of international environmental market pressures. Sometimes, it is a response to the heavy weight of command and control regulation. Other times, it is a response to community pressures. Evidence also shows that local communities and local and international NGOs are increasingly active in pressuring polluting firms. Taken together, these activities suggest enormous activity in this group of countries, designed to make high-speed industrial growth less polluting and use fewer resources. This provides US-AEP with a signal opportunity, one that should not be lost.

Answers to the following four questions highlight major findings:

1. ***To what degree are governments and private sectors responding to new international environmental market pressures as evidenced by green labeling programs, voluntary environmental management standards (such as ISO 14000), and multinational corporation environmental practices (greening of supplier chains)?***

In all ten countries, interest is growing in the potential impact of international environmental market pressures on the ability to export to developed countries. In the more export-oriented economies, real concern exists that International Organization for Standardization (ISO) 14000 and green labeling programs in rich countries could become barriers to trade. Governments in these countries are taking explicit actions to ensure this does not happen. They are establishing green labeling programs and pilot ISO 14000 programs, and they are actively participating in ISO 14000 Technical Committee (TC) 207 meetings. They are investing in pollution prevention, waste minimization, and clean production. And they are working in international fora to ensure that these new programs in rich countries do not violate free trade provisions of the World Trade Organization (WTO).

Governments and private sector exporters in these countries have gone one step further. They have adopted the attitude that green labels and environmental management standards are just another set of market access requirements akin to quality, on-time delivery, and packaging requirements. Because exporters learned how to meet these requirements, some believe that exporters will also learn how to meet these new environmental market access requirements. Governments in this group of countries believe they have an active role in ensuring that this happens.

For the most part, governments and private sectors in the traditionally inwardly oriented economies (India, Sri Lanka, and the Philippines) have been less proactive in responding to these new environmental market pressures. They are, for the most part, not establishing their own green labeling programs or actively preparing their firms to meet new environmental market requirements. This

probably reflects lack of exposure to international environmental market pressures that accompanies an inwardly oriented development strategy.

2. *To what degree are environmental considerations being integrated into the economic and industrial policies and practices of central economic ministries, such as planning agencies, ministries of industry, investment promotion agencies, standards and testing institutes, and science and technology agencies?*

In the first- and second-tier NICs, central economic ministries are increasingly integrating environmental considerations into industrial policy. Integration is most advanced in Singapore and Taiwan, but evidence of it exists in all the other NICs, including Hong Kong.

Integration takes a variety of forms. In Singapore, the Ministry of Environment (ENV) is a coequal partner with the country's two most important industrial policy agencies—the Economic Development Board (EDB) and the Jurong Town Corporation (JTC). EDB promotes industries, JTC provides land to promoted industries in industrial parks, and ENV is responsible for ensuring that promoted industries meet the country's tough emissions standards. Substantial evidence shows that ENV has been highly successful. This is also the case in Taiwan where the environmental ministry works closely with the country's premier industrial policy organization, the Industrial Development Board (IDB). But Taiwan's IDB is much more active than EDB in Singapore in promoting cleaner industrial production. It is subsidizing the development of a domestic environmental goods and service industry that it expects to be export oriented, financing private sector purchases of pollution control and abatement equipment, subsidizing technical assistance in waste reduction and minimization, operating a waste exchange program, and financing research in clean production.

Similar actions exist in virtually all of the export-oriented economies. In Thailand, the Department of Industrial Works (DIW) in the Ministry of Industry, the Thailand Industrial Standards Institute (TISI), and the Thailand Environment Institute (TEI) are cooperating on a green labeling program, an ISO 14000 pilot program, and a donor-funded clean production program. In Indonesia, the planning agency, BAPPENAS, is financing an ISO 14000 certification program with the country's national standards agency, and the Ministry of Industry and Trade operates a donor-funded clean production program. In Korea, the Ministry of Trade, Industry, and Energy (MOTIE) funds an ISO 14000 pilot program, supports a clean technology project with a quasi-public/private industrial technology research institute and has sponsored an Environmentally Friendly Companies Act.

3. *What role do traditional command and control environmental agencies and ministries play in discouraging pollution and promoting resource-intensive industrial development? How do environmental agencies and ministries relate to and interact with economic and industrial ministries?*

In nearly half of the countries—Hong Kong, India, the Philippines, and Sri Lanka—environmental agencies are noticeably weak. Developments in India and the Philippines are typical of this group of countries. In India, concerns about lack of enforcement by the environmental agency are so strong that the courts have taken over from state-level monitoring and enforcement agencies. In the Philippines, historic emphasis on “green” environmental issues, high staff turnover, and insufficient

budgets have tended to make it difficult for the environmental agency to develop and enforce emission standards on industrial polluters.

In Indonesia, Korea, and Thailand, environmental agencies are less weak and governments are in the midst of strengthening them. Following democratization in Korea, government-strengthened environmental laws created a cabinet-level Ministry of the Environment and enhanced its capability to monitor and enforce standards. Some evidence exists that suggest this is paying off. In Indonesia the central planning agency, BAPPENAS, has dedicated an echelon-one official to growing the environmental agency, BAPEDAL. But as yet, BAPEDAL has probably not had much impact on either ambient air or water quality, overall pollution loadings, or pollution intensities. Two of its innovative reputational regulation programs may yet enable it to do so. In Thailand, the 1992 National Environmental Quality Act (NEQA) remedied several serious organizational problems, but several major problems remain. Environmental legislation covers too many parameters, making effective monitoring and enforcement difficult. And significant jurisdictional problems regarding enforcement remain.

In Malaysia, Singapore, and Taiwan, governments have made major commitments to building and sustaining traditional command and control environmental agencies and ministries. These agencies have demonstrated that they can be highly effective. Malaysia's experience with pollution from palm oil production suggests what environmental agencies in this group of countries are capable of accomplishing. There, palm oil production rose sevenfold, export earnings rose fivefold, whereas overall pollution loads declined by 500 percent.

4. How do public awareness and community pressures affect the pollution and resource intensity of industrial production?

The ten countries in this study are experiencing a sea change in public attitudes toward the environment. Pollution problems are regularly reported in the media. Public opinion surveys reveal that growing middle classes are demanding cleaner environments. Communities and NGOs are also organizing for a better environment. "Not in my backyard" (NIMBY) protests affect industrial activities nearly everywhere. They make siting of new plants almost impossible in Taiwan, and they have bedeviled multinationals such as Dupont in India. But NGO and community actions are not limited to NIMBY protests. NGOs are learning how to use the courts against both polluters and governments responsible for controlling pollution. In addition, communities are lodging nuisance complaints with environmental agencies and negotiating with polluters. In several instances, environmental agencies are learning how to utilize public awareness and community pressures to improve environmental outcomes. Some evidence shows that this is an effective way to economize on scarce regulatory resources. It also appears to be leading to a new paradigm for controlling pollution.

Implications of Findings for US-AEP

The country assessments revealed significant industry-environment interactions in the ten countries. Governments and private sectors are responding to new international environmental market pressures. Central economic ministries—planning agencies, ministries of industry, science and technology

institutes, and national standards institutes—are increasingly investing in environmental programs. Environmental ministries are becoming stronger and NGOs and communities are organizing for a better environment. Taken together, these activities could well be the incubator for what US-AEP terms a “clean industrial revolution.” This provides US-AEP with a signal opportunity that should not be missed. But, at the moment, some of this activity is nascent, inchoate, and at least partially donor driven. This means that, except for a few cases among the highest income NICs, no consistent policy framework exists to promote a clean industrial revolution.

If US-AEP is to target its partnership programs to promote cleaner industrial production successfully, it is important to recognize that success will depend heavily on development of an appropriate policy framework in each of the ten Asian countries. The suggestions below outline approaches that US-AEP might encourage to strengthen these frameworks.

1. Important differences across countries suggest the need to develop country-specific programs and to develop mechanisms for sharing country experiences.

Because Taiwan and Singapore have well-developed industry and environment programs, emphasis there should focus on learning between the two countries and sharing lessons learned with others. Because interest is high and programs are less well-developed in Thailand, Malaysia, Indonesia, and Korea, this group of countries provides a key opportunity for significant US-AEP partnership development. US-AEP should consider focusing its resources on these countries. Because interest is significantly lower in India, Hong Kong, the Philippines, and Sri Lanka, US-AEP work there might emphasize sharing what has been learned elsewhere in Asia.

2. This keen interest in reducing the pollution intensity of production provides ample opportunity for developing policy analysis and information networks and for sharing experiences, particularly among the ten countries and between the ten countries and the United States.

It would be highly worthwhile for US-AEP to fund a series of collaborative Asian and Asian-American partnership networks. Potentially noteworthy candidates include the following:

a. An Asia region network that provides opportunities for individuals in institutions of industrial policy planning agencies, ministries of industry, science and technology institutes, and standards agencies to share experiences and develop, where appropriate, regional action plans to solve common problems.

The network might include, for example, representatives from EDB in Singapore, the Malaysia Industrial Development Authority (MIDA), the Ministry of Finance and Economics (MOFE) in Korea, IDB in Taiwan, and the Ministries of Industry and Trade in Indonesia and Thailand. Among other things, representatives from these organization could share experiences with incentive programs to reduce pollution intensity. Alternatively, it might make sense to establish a clean production network that involves universities and science and technology institutes, such as the Industrial Technology Research Institute (ITRI) in Taiwan, the Singapore Institute of Standards and Industrial Research (SISER), the Standards and Industrial Research Institute of

Malaysia (SIRIM), and the Korea Academy of Industrial Technology (KAITECH). This program might also be productively linked with the U.S. National Academy of Engineering.

b. A policy analysis partnership network of Asian and American academics, research institutes, and government organizations that examines alternative incentives for promoting a clean industrial revolution.

Individuals and organizations in the network would conduct, publish and disseminate studies, hold workshops and conferences, engage in policy dialogue, and produce an annual flagship publication that includes indicators of progress. The network should include collaboration with the World Bank and the Asian Development Bank.

c. A regional industry and environment working group.

The purpose of this working group of industrial and NGO representatives would be to address regional problems through the partnership mechanisms that US-AEP has fostered. These might include a common action agenda for ISO 14000 or a common environmental code of conduct for foreign investors, particularly those with poor environmental records.

3. A wide range of incentive programs in these countries are designed to reduce the pollution intensity and resource-use intensity of industrial production. But little is known about whether these programs work or whether they are cost-effective.

Because these industry incentive programs are important to US-AEP, the Secretariat should support the analysis of a selected number of these programs to determine whether or not they are or can be made cost-effective. Potential candidates for study include Taiwan's environmental goods and services export promotion program; Singapore's water-saving program; Korea's, Thailand's, and Indonesia's clean production programs; and Korea's Environmentally Friendly Companies Act. These policy studies provide an opportunity for building a partnership network of analysts of industry and environment policy studies in the ten countries.

4. Because US-AEP is working in largely uncharted territory, it is extremely important that the Secretariat of US-AEP have in-house analytic and policy capacity.

The proposed virtual policy center could well fill this role. The testing of assumptions, the analysis of relevant U.S. and selected Asian experience for application to other places in Asia, and the ability to stay current with rapidly evolving developments in Asia, America, and Europe will be critical to progress in this complex arena. Given the reputation of US-AEP for pioneering change, unless this capability is developed, it will fail to realize the opportunities and challenges it faces, which would be a tragedy.

1. Introduction

For the last fifteen years (1980–95), economic development in Asia has been little short of astonishing. To take but one example, while the rest of the developing world was experiencing a debt crisis and negative economic growth, economies in Asia boomed and average incomes doubled. Equally astonishing, high growth in Asia, particularly in the newly industrializing economies (NICs) in East Asia,¹ was coupled with low income inequality and rapid declines in the incidence of poverty. This experience convincingly demonstrates that not all growth is inequitable; nor does it or need it bypass the poor.

But broadly based growth in Asia has come at great expense to the environment. Forests are disappearing at alarming rates, marginal land is rapidly being degraded, and intense pressures are being placed on arable land. Pollution loads attending urbanization and industrialization are also rising rapidly. Water pollution, especially that brought on by high organic pollution loads, is a serious problem almost everywhere. Rapid shifts in industrial structure have contributed to significant increases in the toxicity of industrial effluents. Handling and treating this hazardous and toxic waste is everywhere inadequate. The high energy intensity of industrial growth, reliance of some countries on coal, and high transport densities in Asia's megacities all contribute to an equally serious air pollution problem.

This stark contrast between high-growth Asia's successful economic development and rapidly deteriorating environments, particularly urban-industrial environments, makes the region the foremost test of sustainable development. Because others are trying to emulate the region's economic success, particularly with exports of manufactures, success in reducing the pollution intensity and resource-use intensity of industrial development there may offer invaluable lessons for others.

This raises a critical question: How might a broadly gauged United States-Asia Environmental Partnership (US-AEP) program contribute to reductions in the pollution intensity and resource-use intensity of industrial production?² Answering these questions requires knowing more about the nature of industry-environment interactions in high-growth Asia. Because of this, the Secretariat for US-AEP asked a small multidisciplinary team to look closely at those interactions in ten Asian countries—four first-tier NICs (Hong Kong, Singapore, South Korea, and Taiwan), three second-tier NICs (Indonesia, Malaysia, and Thailand), and three historically slower growers (India, the Philippines, and Sri Lanka).

2. Study Methodology

Examination of industry-environment interactions in the ten Asian countries focused on identifying and assessing the probable impact of those forces (government policies, community and nongovernmental organization [NGO] pressures, and emerging environmental market pressures) thought most likely to influence the environmental behavior of manufacturing firms. The study methodology consisted of in-depth interviews and literature reviews. Because of this, findings reported here are indicative rather than definitive. They convey a broad sense of what is happening rather than rigorous analysis of the links among government policy, community actions, and market pressures on the polluting behavior of manufacturing firms.

Government policies can affect the behavior of polluters in one of two ways. Traditionally, states affect environmental behavior through regulation by command and control environmental agencies and ministries. Doing this requires building such agencies and then empowering them to set standards and monitor and enforce them. Regulatory agents have several options for getting polluters to adhere to standards: they can command firms to meet them, they can engage firms in voluntary compliance programs, or they can rely on market-based instruments.

But these are not the only actions states can take. Experience in other areas in Asia, particularly in promoting exports of manufactures, suggests that governments can take (and have taken) a variety of actions to overcome market, information, and coordination failures. Sometimes governments subsidize activities. Sometimes they make public investments in research and development. Other times they create unique relationships between the public and private sector or create public sector institutions to overcome market failures. Because of this and because environmental outcomes are subject to market, information, and coordination failures, it is important to examine what nonenvironmental agencies—commercial banks, ministries of industry, planning agencies, investment promotion boards, national standards agencies, and science and technology institutes—are doing to reduce the pollution intensity or resource-use intensity of industrial development.

Communities affect the environmental behavior of polluting firms either by mobilizing to thwart new investment decisions (“not in my backyard” or NIMBY campaigns) or by negotiating directly with factories. Evidence of this is growing in Organization for Economic Cooperation and Development (OECD) countries and Asia. Sometimes, community actions involve local governments (municipalities), as in Japan. Sometimes, they involve organized community groups, either environmental or otherwise (religious groups, for example). Environmental agencies can complement the work of communities when they provide communities with public information on polluting behavior. This has worked both in the United States and in Indonesia.³

Markets also may affect a firm’s polluting behavior. This can happen in several ways. If environmental reputation matters to investors, consumers, or other buyers of a firm’s products, firms may take actions to enhance their environmental reputations. This can take the form of complying with green labeling programs, meeting buyer environmental specifications,⁴ or complying with international voluntary environmental management standards (International Organization of Standardization [ISO] 14000). It can also mean meeting environmental due diligence requirements of investors. Some of this

may occur within local markets. But some of this may involve local firms in developing countries actively engaged in exporting to developed country markets. Given the export orientation of the high-growth Asian economies, meeting these international environmental market demands may be particularly important.

This conceptual framework, which focuses on the impact of policies, community and NGO actions, and market pressures on the polluting behavior of manufacturing firms, was used by the study team to focus the country assessments on the following questions:

1. To what degree are governments and private sectors responding to new international environmental market pressures as evidenced by green labeling programs, voluntary environmental management standards (such as ISO 14000), and multinational corporation environmental practices (greening of supplier chains)?
2. To what degree are environmental considerations (such as reducing the pollution intensity and resource-use intensity of industrial production) integrated into the economic and industrial policies and practices of central economic ministries, such as planning agencies, ministries of industry, investment promotion agencies, standards and testing institutes, and science and technology agencies?
3. What role do traditional command and control environmental agencies and ministries play in promoting less pollution and resource-intensive industrial development? How do environmental agencies and ministries relate to and interact with economic and industrial ministries?
4. How do public awareness and community pressures affect the pollution and resource intensity of industrial production?

3. Assessment Findings

What did the assessment teams find? The short answer is: much more than expected. Virtually everywhere assessment teams went, they found substantial evidence of public and private sector actions designed to affect the environmental behavior of manufacturing firms. Virtually everywhere, governments have built or are building traditional command and control environmental agencies. More important, these agencies are experimenting with a wide range of market-based and reputational incentive programs.

But environmental actions neither start nor stop with the activities of traditional environmental agencies. Central planning agencies, ministries of industry, science and technology institutes, and national standards agencies are all more or less involved in mainstreaming environmental considerations into economic and industrial policies. Sometimes, this is a direct consequence of international environmental market pressures. Sometimes, it is a response to the heavy weight of command and control regulation. Other times, it is a response to community pressures. Evidence also exists that local communities and local and international NGOs are increasingly active in pressuring polluting firms. Taken together, these activities suggest enormous interest in this group of countries in making high-speed industrial growth less polluting and resource intensive. This provides US-AEP with a signal opportunity, one that should not be lost.

Answers to the following four questions highlight major findings:

1. To what degree are governments and private sectors responding to new international environmental market pressures, as evidenced by green labeling programs, voluntary environmental management standards (such as ISO 14000), and multinational corporation environmental practices (greening of supplier chains)?

In all ten countries, interest is growing in the potential impact of international environmental market pressures on ability to export to developed countries. In the more export-oriented economies, real concern exists that ISO 14000 and green labeling programs in rich countries could become barriers to trade. Governments in these countries are taking explicit actions to ensure this does not happen. Several countries—Malaysia, Taiwan, Thailand, and Singapore—have green labeling programs. Each is also following ISO 14000 closely, and each has some kind of ISO pilot program. Some, such as Korea, are working in international fora to ensure that these new programs in rich countries do not violate free trade provisions of the World Trade Organization (WTO).

Governments and private sector exporters in these countries have, for the most part, adopted the attitude that green labels and environmental management standards are simply another set of market access requirements akin to quality, on-time delivery, and packaging requirements. Because exporters have learned how to meet these requirements, some believe they will also learn how to meet these new environmental market access requirements. Governments in this group of countries believe they have an active role in ensuring that this happens.

Thailand's ISO 14000 "program" is typical of how governments and the private sector in the more export-oriented countries are responding to international market pressures. Because the Thai government and private sector underestimated the importance of ISO 9000, it has proved difficult and costly for Thai firms to gain certification. This time (with ISO 14000), the government wants to ensure that this will not happen. To do so, the Thailand Industrial Standards Institute (TISI) is actively participating in all phases of ISO 14000 Technical Committee (TC) 207 meetings. It now routinely sends twenty to thirty people to TC 207 meetings. It does so to ensure that concerns of developing countries such as Thailand are embedded in ISO standards and to get a headstart on implementing ISO environmental standards.

Following adoption of the ISO 14001 Environmental Management System (EMS) standard by the International Standards Organization, Thailand plans to adopt this standard, announce it quickly, and begin the process of obtaining ISO certification rights. In preparation for this, TISI has been relying on a British environmental auditing firm to train TISI auditors. TISI also has a pilot ISO 14000 program for ten Thai firms. The ten firms are all ISO 9000 certified. Firms in this program have committed in writing to establishing internal EMS standards, employing two people full-time to work on EMS standards, and seeking ISO certification once it takes effect. Because the Thai government has decided to emphasize a private sector approach to ISO 14000 certification, TISI is planning to become an accrediting body of private sector certifiers. It is training environmental auditors for the Department of Industrial Works (DIW) in the Ministry of Industry and the Thailand Environment Institute. And it is considering how to certify small- and medium-scale enterprises without violating provisions of the WTO charter.

Governments and private sectors in the traditionally inwardly oriented economies (India, Sri Lanka, and the Philippines) have for the most part been less proactive in anticipating or responding to environmental market pressures. Sometimes, these programs are seen as vehicles for keeping poor countries poor. Other times, as with corporate "greening of the supplier chain" programs, they are viewed suspiciously. More important, these programs are simply less well-known in the inwardly oriented countries. Lack of interest and programs for ISO 14000 in standards institutes typifies what is happening in this group of countries. This probably reflects lack of exposure to the international environmental market pressures that accompanies an inwardly oriented development strategy. Lack of interest and action also reflects concern for more important issues. In several of these countries, the focus of attention is on surviving economically, making an economic liberalization program stick, and reforming an otherwise inefficient economy.

What are the implications of these differing responses to international market pressures? Several stand out:

- a. Interest in green labeling programs, voluntary environmental management standards, pollution prevention, clean production, and multinational greening of supplier chain programs is largely being propelled by forces beyond these Asian countries borders. Because of this, interest in and reactions to them are strongest in those countries focused on exporting manufactures and weakest where such exports are not significant.*

Green consumer movements in rich countries, particularly in Europe, are spawning green labeling programs in Asia that require cooperation among environmental organizations, ministries of

industry and/or commerce, and standards agencies. Voluntary environmental management standards, particularly ISO 14000, are driving these same agencies to work more closely with trade and industry associations and individual firms in developing countries. Donor-funded pollution prevention or clean technology programs are also facilitating cooperation among environmental ministries, environmental NGOs, ministries of industry, and science and technology institutes. In addition, increased environmental requirements of multinationals, who either buy or produce within particular developing countries, are having similar effects. Taken together these activities, although inchoate and tenuous at the moment, have the potential to mark a significant turning point in industry-environment interactions. They could prove to be the incubator of what US-AEP terms a “clean production revolution” in industry.

But several cautions must be expressed regarding these programs:

- b. Although interest in them is great, particularly in clean production and ISO 14000 in ministries of industry, science and technology institutes, and standards and testing agencies, these programs are nascent, inchoate, and sometimes donor driven and based on extremely limited knowledge.***

This provides both an opportunity and a reason for caution. Because of openness to these ideas, it will not be difficult to engage industrial policy institutions in the ten countries in discussions, exchanges, research, and action programs, particularly on clean production and ISO 14000. The danger is that this will be all too easy to do, before any real clear understanding exists of what such programs have to offer. If they have less to offer than one hopes or if they are offered in ill-advised ways, this could seriously damage long-run opportunities in this area.

- c. Except for Singapore, Taiwan, and Malaysia, the three countries with the most sophisticated environmental regulatory agencies, a tendency exists to view clean production and ISO 14000 as alternatives to command and control environmental regulatory policies.***

This is a mistake. As evidence from OECD countries and Singapore and Taiwan show, clean production should be viewed as a complement to and not a substitute for a strong, competent environmental agency with tough standards and equally tough enforcement practices. Some danger exists that focusing on clean production programs will divert attention from the equally important task of building and sustaining strong, competent environmental agencies. The same can be said for ISO 14000. Intense interest in it exists, particularly in traditional economic and industrial policy agencies in which concern about access to export markets is strong.

- d. Both clean production and pollution prevention programs and ISO 14000 fit nicely with the historical roles of industrial policy agencies. They operate either by providing fiscal or financial incentives (clean production) or by reducing market barriers to exports (ISO 14000). These are the kinds of things that East and Southeast Asia's effective industrial policy agencies do best.***

This stands in marked contrast to command and control or market-based regulation of firms that punish firms for polluting. It is, thus, not surprising that industrial policy organizations prefer the former to the latter.

2. To what degree are environmental considerations being integrated into the economic and industrial policies and practices of central economic ministries, such as planning agencies, ministries of industry, investment promotion agencies, standards and testing institutes, and science and technology agencies?

In the first- and second-tier NICs, central economic ministries are increasingly integrating environmental considerations into industrial policy. Integration is most advanced in Singapore and Taiwan, but evidence of it exists in all the other NICs, including Hong Kong.

Integration takes a variety of forms. In Singapore and Taiwan, it involves explicit cooperation between the country's chief industrial policy organization and its environmental ministry. Sometimes, as in Thailand, it involves cooperation among the ministry of industry, the national standards institute, a scientific and technology institute, and the country's preeminent environmental NGO. In Korea, it involves private industry associations and quasi-public research institutes.

Taiwan offers one example of how to integrate environmental considerations into an industrial development strategy. This is being accomplished in three principal ways. First, the government is pursuing an import substitution and industrial development strategy to create an indigenous environmental goods and services industry that it expects will become export oriented. Second, it heavily subsidizes industrial purchases of pollution control and abatement equipment. Third, the government is financing research into clean production and providing industry with subsidized technical assistance in waste reduction and minimization.

All of this is part of the latest industrial development strategy. Appreciation of the exchange rate, rising wage rates, emerging labor shortages, and increased demands for a cleaner environment contributed to an export of industry that some in the country's premier industrial policy agency, the Industrial Development Bureau (IDB) of the Ministry of Economic Affairs, feared was leading to a "hollowing out of industry." To prevent this, the government promulgated a new six-year national development plan to upgrade industry. This included providing selected incentives to firms to purchase automated production equipment and technology; increase research and development (R&D) expenditures; improve product quality, increase productivity, reduce energy use, and promote waste reclamation; and purchase pollution control and abatement equipment.

The government also began to promote twenty-four key, high-tech, high value-added items in ten emerging industries. Promoted industries included communications, semiconductors, precision machinery, aerospace, and, most notably, environmental goods and services. These industries were selected because they cause little pollution, have strong market potential, are technologically demanding, are not energy intensive, and have high value added.

The government is relying on several promotional privileges to facilitate the growth of a domestic environmental goods and services industry. Firms in this nascent industry have by law been organized into industry-specific associations. Government environmental contracts, such as for the building of

public sector waste incinerators or providing waste minimization and reduction technical assistance to private sector firms, are reserved for firms in these highly industry-specific associations. Because the government has adopted an explicitly private sector approach to environmental cleanup, these benefits are likely to be substantial.

Domestic environmental goods and services providers are also favored by tax policy. Firms in all of the ten emerging industries, including the environmental goods and services industry, are eligible for either a 20 percent investment tax credit or a five-year tax exemption plus a double retaining of surplus earnings. They are eligible for loans from commercial banks and the Executive Yuan's Development Fund at preferential rates, and they are given priority consideration in the acquisition of industrial land. Local environmental hardware providers benefit from a 20 percent tax credit that accrues to firms purchasing pollution control and abatement equipment. Firms in this industry are also eligible for export assistance, but little is known about how this program works. If it follows practice elsewhere in East Asia, access to assistance may be conditioned on export performance. Because the government has established explicit export targets for the environmental goods and services industry through 2002, something like this may be happening.⁵

The government also offers a wide range of programs in pollution prevention, waste minimization, and clean production. A joint IDB and Taiwan Environmental Protection Agency Waste Reduction Task Force provides free technical assistance to firms on waste reduction and minimization. IDB also runs an Information Service for Exchange of Industrial Wastes and sponsors demonstration projects. In addition, IDB finances a growing research program on clean technologies. It has created a Clean Technologies Unit in Division 7 of IDB and contracted its research on clean technologies out to the UCL laboratory of the Industrial Technology Research Institute (ITRI). Most remarkably, ITRI's clean technology researchers are going well beyond plant-by-plant pollution prevention. They are watching closely what others (such as 3M and the United States Environmental Protection Agency's [USEPA's] Toxic Release Inventory) are doing, and they are exploring several cost-effective alternatives for developing policy-relevant estimates of the pollution intensity of output by industry subsectors. One of these measures compares the weight of materials used to produce a product to the weight of the final product. Another looks at waste (the difference between the weight of inputs and the weight of final product) per New Taiwan Dollars (NT\$) of sales. A third disaggregates waste into four categories (raw materials, industrial water, energy, and toxic chemicals) per NT\$ of value added.

No less instructive for other Asian countries is Singapore's strategy for integrating environmental considerations into industrial policy. It differs from Taiwan's approach in two unique and extremely important ways. To begin with, the Ministry of the Environment (ENV) in Singapore is a coequal partner with the country's two most important industrial policy agencies—the Economic Development Board (EDB) and the Jurong Town Corporation (JTC). EDB is like IDB, its counterpart in Taiwan. It offers lucrative fiscal and financial incentives to firms in industries the country wants to see expand. In the 1960s, EDB promoted labor-intensive industries; in the 1970s, it promoted electronics and petrochemicals; and, in the 1980s, it promoted high value-added industries. JTC is the physical facilities and industrial land administration arm of industrial promotion. JTC owns land in industrial estates and builds industrial parks, sites factories, and provides roads, sewers, and electricity. ENV is responsible for ensuring that Singapore is promoting cleaner rather than dirtier industries and for ensuring that promoted firms address their pollution problems before

they receive promotional privileges from EDB, before they are sited by JTC, and before they begin production. This authority makes it responsible for ensuring that all new investment, including foreign investment, meets the country's tough emissions standards.

In addition, ENV and EDB have adopted a pragmatic policy approach to clean production. Any firm wanting to implement pollution prevention, waste minimization, or clean production is eligible for accelerated depreciation of capital costs from EDB. Eligibility for this tax benefit hinges on demonstration to ENV that pollution prevention, waste minimization, or clean production investments actually reduce emissions below the allowed limits. A similar scheme exists for saving potable water, a particularly scarce commodity in Singapore. If a firm uses more than 3,000 cubic meters of water per month and reduces its water use by at least 50 percent, it is eligible for a low interest loan from EDB. The loan covers the cost of buying and installing water-saving equipment.

Not surprisingly, Singapore also has an active ISO 14000 program. ENV's Strategic Research and Planning unit is watching ISO 14000 closely and looking into ways to introduce it quickly in Singapore, if needed. But ENV is taking a wait-and-see attitude, trying to answer such questions as: Will ISO 14000 certification actually be required for access to markets? Will compliance give Singaporean firms a competitive advantage? The Singapore Productivity Standards Board (SPSB) is taking a more active role. It already does testing and certification for ISO 9000 and is preparing itself for testing and certification for ISO 14000. In addition, SPSB has an active joint program with the European Union—the Regional Institute of Environmental Technology (RIET)—to promote and facilitate appropriate environmental technology in Asia.

Integration of the environment into industrial policy is less comprehensive, coordinated, and coherent, but no less visible in the other NICs. There too, it tends to be driven by external market pressures as well as by donors. In Thailand, DIW in the Ministry of Industry, TISI, and the Thailand Environment Institute (TEI) are either working or cooperating on a green labeling program, an ISO 14000 training and certification program, and a donor-funded clean production and pollution prevention program. The Federation of Thai Industries (FTI) and particular industry "clubs" have been actively engaged in some or all of these programs, spurred and assisted by active support from the U.S. Agency for International Development (USAID) in the 1980s and early 1990s.

One can see similar developments in Indonesia. There, the country's planning agency, BAPPENAS, is supporting standards and testing agencies that are developing ISO 14000 certification programs. Similar programs are developing within the Ministry of Industry and Trade (MOIT). MOIT's Center for Research and Development on Business Climate and the Environment is the focal point for several donor-funded clean production projects. Some evidence also exists that several of MOIT's industry-specific research and development institutes outside Jakarta may be beginning to be involved in clean production.

Much the same can be said for Korea and Malaysia and to a lesser extent Hong Kong. In Korea, the Ministry of Trade, Industry, and Energy (MOTIE) is involved in mainstreaming the environment into industrial policy in several ways. It funds an ISO 14000 pilot project with the national standards agency. It funds a clean technologies project with the Korea Academy of Industrial Technology (KAITECH), a quasi-public/private industrial technology research institute. It has promulgated an Environmentally Friendly Companies Act. Companies wanting to receive this designation from

MOTIE are expected to shift environmental management away from end-of-pipe to pollution prevention, significantly reduce emissions, and adopt environmental management systems that can be precursors to ISO 14000. MOTIE also funds a program with the Korea Association of Machinery Industry (KOAMI), the country's premier capital goods industry association. MOTIE's collaboration with KOAMI includes a soft loan program that funds end-of-pipe environmental solutions to industrial pollution and the Han project, which aims to prepare Korean firms to become substantial exporters of environmental goods and services to firms in Southeast Asia.

Why are governments and agencies of industrial policy in the first- and second-tier NICs doing these things? This question has several answers. First, democratization, growing public concern about the environment, and almost intractable NIMBY problems mean that governing elites can no longer ignore industrial pollution. In addition, at least in the first-tier NICs, appreciation of the exchange rate, rising wage rates, and emerging labor shortages, along with increased demands for a cleaner environment contributed to an export of industry during the 1980s. Many of the firms that migrated were in industries—textiles, leather goods, and metal and electroplating industries—considered to be excessively dirty or polluting. On the other hand, the new high-tech industries being promoted are considered relatively clean. Said in another way, the latest competitive shift in industrial structure is away from industries with high pollution intensities toward industries with low—or at least lower—pollution intensities. Industrial policy just speeds this process.

Second, acute recognition exists within governments in the NICs that international competitiveness demands better environmental behavior. Exporters are learning from direct experience that they have to certify to importers in some developed countries that their products meet importing country environmental regulations. Officials are also aware of the competitive value of green labeling. These same officials are all too acutely aware of the possible impact of ISO 14000 on international competitiveness. Third, activist governments, at least in the first-tier NICs, expect the demand for environmental goods and services in Southeast Asia to grow rapidly over the next several years. They are preparing to capture a substantial share of this market. They see this as part of the next step up the industrial ladder.

Third, some view this approach to industrial pollution control and reduction as more cost-effective than the alternatives. They believe that tough emission and effluent standards and equally tough enforcement are necessary to get firms to accept protecting the environment as part of the cost of doing business in a highly competitive global economy. But, they believe equally strongly that fiscal and financial incentives can quicken the shift to a less polluting industrial growth strategy. And they know from direct experience that pollution prevention sometimes pays. For all these reasons then, the institutions of industrial policy in the first- and second-tier NICs are increasingly being turned toward reducing industrial pollution.

Unfortunately, the same cannot by and large be said for the more inwardly oriented countries—India, Sri Lanka, and the Philippines. In virtually all of them, environmental ministries tend to be weaker, industrial policy is either inchoate or nonexistent, and attention is directed elsewhere, particularly to economic liberalization programs designed to reduce rent seeking and get the economy moving. This does not mean that no programs exist in these countries to reduce pollution intensity or encourage clean production. Each country has one or more such programs. But they are largely donor driven, they are not integrated with the rest of the policy machinery, and private sector support for them is

weak. Because of this, not much opportunity exists for integrating the environment into economic and industrial policy or for promoting programs to reduce the pollution intensity and resource-use intensity of industrial production.

What are the major implications of these industry and environment interactions? Several are particularly notable.

- a. Integration of the environment into the institutions of high-speed growth and industrial policy has proceeded farthest in those countries with the strongest traditional environmental ministries.*

This is most clear in Singapore and Taiwan where relatively strong environmental agencies work closely with traditional industrial policy and industrial estate management organizations.

- b. Where environmental ministries remain weak and industrial policy institutions strong, much conflict occurs between the two, which limits the potential for effective integration of the environment in industrial policy.*

This situation can be seen most clearly in Korea and Indonesia and to a lesser degree in Thailand. In each of these countries, bureaucratic struggles over which agency or ministry will have responsibility for ISO 14000, green labeling programs, and clean production or pollution prevention programs limit the integration of the environment into the institutions of economic and industrial policy.

- c. Where environmental ministries are weak and industrial policy is either inchoate or nonexistent, industry-environment interactions are most likely to be driven by donor projects or unavoidable external market pressures.*

In India, Sri Lanka, the Philippines and, to a lesser degree, Indonesia, industry-environment interactions are driven first by donor-funded pollution prevention or clean production projects and to a far lesser extent by external market demands. When this happens, little real ownership of or economically driven, self-interest in the program tend to occur within host country institutions and organizations. Although these programs may lead to better integration, as it appears to be doing in Thailand, for example, progress is slow and uncertain. It is also not clear how, absent internally driven economic and political pressures, such programs can become more effective.

- 3. What role do traditional command and control environmental agencies and ministries play in promoting less pollution-intensive and resource-intensive industrial development?*

In nearly half of the countries—Hong Kong, India, the Philippines, and Sri Lanka—environmental agencies are noticeably weak. Developments in India and the Philippines are typical of this group of countries. In India concerns about lack of enforcement are so strong that the courts are taking over from state-level monitoring and enforcement agencies. In the Philippines historic emphasis on “green” environmental issues, high staff turnover, and insufficient budgets have made it difficult for the environmental agency to develop, monitor, and enforce emission standards on industrial polluters. In Hong Kong, significant deindustrialization, a government laissez-faire attitude, and the difficulty

of enforcing emission standards for extremely small-scale manufacturers located in vertically integrated, flatted factory buildings have combined to undermine the effectiveness of environmental regulations. Not surprisingly, what little evidence available suggests that among most of the countries in this group—Hong Kong may be the exception—severe industrial environmental problems are getting worse than better.

In three other countries—Indonesia, Korea, and Thailand—environmental agencies are weak. But governments are in the midst of strengthening them, and some evidence exists that at least in one, Korea, this is having an impact on ambient environmental quality, overall pollution loadings, and possibly the pollution intensity of industry. The legal framework for the environment in Korea dates from 1978, but it was not until 1990, three years after democratization, that the national assembly significantly strengthened Korea's environmental laws. Each year since then, the cabinet-level Ministry of the Environment has gotten bigger and better. Substantial evidence now exists that the ministry has significantly enhanced capabilities to monitor and enforce emissions standards. With respect to the former, the ministry has an impressive set of monitoring capabilities that make it possible to report regularly on ambient air (five indicators) and water quality (three indicators). The environment ministry also measures and annually projects overall pollution loads for industry for these five air pollutants and three water pollutants. This makes it possible to track loadings over time (they have been falling since 1990) and by industry (textiles, paper, and food processing are the major water polluters). The environment ministry also routinely inspects about 25,000 firms per year for air emissions and about 15,000 per year for water emissions. It routinely issues warnings, orders improvements, suspends operations, imposes pollution charges for emissions in excess of standards, and, in about 3 percent of the cases, shuts down operations. Because pollution loads for measured indicators are stable or falling, it would appear that pollution intensities may have begun to fall in Korea.

In Indonesia, the central planning agency, BAPPENAS, has dedicated an echelon-one official to growing the environmental agency, BAPEDAL, into an effective body. This manifests itself in increased budget support and staffing and donor projects to build capacity in several areas, including the systematic gathering and analysis of environmental data and the setting, monitoring, and enforcing of emission standards. It also manifests itself in high agency morale. As yet, BAPEDAL has probably not had much impact on either ambient air or water quality, overall pollution loadings, or pollution intensities, but two of its innovative reputational regulation programs may yet enable it to do so.

In Thailand the last national development plan and a 1992 National Environmental Quality Act (NEQA), which created three new departments—a policy planning office, a pollution control department (PCD), and an environmental quality promotion department—in an expanded Ministry of Science, Technology, and the Environment (MOSTE) remedied some of the environmental agencies' organizational problems. But several major problems remain. For one, environmental legislation covers too many parameters, making it difficult for PCD to monitor behavior effectively. Second, significant jurisdictional problems regarding enforcement remain among PCD, the Department of Industrial Works in the Ministry of Industry, and the police in the Ministry of Interior. But if the Thai government follows the practice adopted in other policy areas of building consensus before making major policy changes, change may well be on the way.

In three other countries—Malaysia, Singapore, and Taiwan—governments have made major commitments to building and sustaining traditional command and control environmental agencies or ministries. These agencies have demonstrated that they can be highly effective. Malaysia's environmental agency dates from 1974. Since then, Malaysia has enacted fifteen other specific environmental laws. Singapore's environmental agency dates from 1969 when the government created a precursor to a traditional command and control environmental ministry and made it a coequal partner with two powerful industrial policy agencies. Taiwan started much later than either Singapore or Malaysia, but it too invested resources in creating a substantial command and control agency with real enforcement powers.

How have these differences among environmental agencies affected environmental quality? Limited environmental data make it difficult to give a definitive answer, but substantial evidence exists that effective command and control environmental agencies can and do make a difference. Three examples—Singapore, Malaysia, and Taiwan—make this clear.

Singapore. Since the 1960s, Singapore's economic growth has depended on its deep-sea port, a relatively abundant and cheap but increasingly skilled labor force, and an industrial policy intended to entice multinational corporations to invest in and export from Singapore. In the eyes of Singapore's government, achieving this objective required an active industrial development policy.

As mentioned earlier, three government institutions have dominated industrial policy—EDB, JTC, and ENV. EDB offers lucrative fiscal and financial incentives to attract multinationals to invest in Singapore. JTC is responsible for implementing much of the country's master plan for land use and for building and managing the country's industrial estates in which all industrial activity is located. ENV is responsible for ensuring that all new investment, including foreign investment, meets the country's tough emissions standards.

Both EDB and JTC cooperate with ENV in the planning stage of industrial development. Once EDB attracts a firm, JTC sites it in one of its industrial parks. As part of this siting process, firms must provide JTC information on raw material use and plans for storage of raw materials. They must also provide a description of their production processes, including the kinds and specific quantities of pollutants or waste. Along with this, firms must provide detailed plans on how they plan to treat and/or minimize wastes to meet emission standards. JTC forwards all of this information to ENV for approval.

ENV's role in this process is to ensure at an early decision stage that Singapore is attracting the right kind of industries and multinationals and that promoted firms are addressing their pollution before they receive promotional privileges from EDB, before they are sited by JTC and permitted to build their facilities, and before they begin operation. Three aspects of ENV's role are most striking. First, it began these functions in 1969 when most countries, including the United States and Japan, were in the formative stages of developing their own environmental agencies. Second, it has been, almost from the beginning, a coequal participant with EDB and JTC. Third, in addition to setting emission and ambient standards and monitoring and enforcing them, ENV is responsible for all refuse collection, the country's sewer system, water treatment plants, and incineration plants for solid waste. In this way, ENV has learned how to treat environmental infrastructure as an important component of industrial development.

Two other aspects of ENV activities deserve mention. It has learned from direct experience what it is possible for firms to do to treat pollution to meet emission standards. In the early days, because neither ENV nor firms knew how to meet emission standards, ENV sent its people all over the world to look at what others were doing and what was possible. This led to the creation of a preferred list of environmental hardware and software suppliers that was shared with prospective investors. Until recently, ENV has not focused on clean production, nor has it offered incentives for firms to reduce the pollution intensity of industrial production. Rather, ENV has set tough emissions standards and rigorously monitored them. It has left it to firms to decide the most cost-effective way for meeting these standards. Four major consequences result from these practices. First, evidence on ambient air quality suggests that rapid industrial growth and development in Singapore occurred without much deterioration in air quality. Second, ambient air quality in Singapore since the mid-1970s has been no worse than it has been in most of the OECD countries. Third, this example casts substantial doubt on the argument that imposing tough environmental standards in the early stages of industrial growth imposes high costs, in terms of growth foregone. In fact, those in Singapore's environmental ministry argue the opposite. They believe that tough environmental standards when applied in clear and transparent processes actually make it easier for investors, including foreign investors. Given the country's long and successful dependence on foreign investment and exports by those investors, it is difficult to disagree with this assessment. Fourth, experience in Singapore suggests that it is also probably more cost-effective to tackle pollution problems up front rather than pursue a "grow now-clean up later" environmental strategy.

Malaysia. The impact of tough standards and equally tough monitoring and enforcement on ambient environmental indicators is equally clear in Malaysia. Malaysia's approach to water pollution from palm oil production makes the case. By 1975 Malaysia was a major producer and exporter of crude palm oil, and palm oil producers were far and away the country's major water polluters. In 1975 pollution generated by palm oil mills equaled that of 10 million people. Partly because of this problem, the government passed an Environmental Quality Act in 1974, which established the Department of the Environment (DOE), which was given responsibility for setting emission standards and monitoring and enforcing those standards.

DOE relied on expert committees composed of representatives from business and government to study the problem. Once it became clear that cost-effective treatment was possible, DOE announced regulations on eight parameters. They also made it clear that standards would become tougher over time. Because the legislation authorizing DOE to monitor and enforce standards also gave them the ability to license factories before they could operate, DOE used its licensing ability to enforce standards. This was exercised by either linking license fees to pollution loads or by revoking licenses and closing factories. Over time, DOE exercised both options. As a result, despite exponential growth in the crude palm oil industry between 1975 and 1990, pollution discharges from this industry (biological oxygen demand or BOD load) peaked in 1978 at about one half million tons per day and rapidly declined thereafter. This is a clear example of declining pollution intensity forced by strong enforcement and effective engagement and cooperation with the polluting industry.

Taiwan. The Taiwanese Environmental Protection Agency has had similar successes. Unlike Singapore, Taiwan followed a "grow first/clean up later," export-led industrial development strategy. The country's first environmental laws date from the mid-1970s, but they had little effect until the mid-1980s when the government created a cabinet-level Taiwan Environmental Protection Agency

(TEPA) and modeled it on USEPA. TEPA was given responsibility for standards setting, environmental monitoring, and enforcement.

In a few short years, it evolved into a respectable environmental agency. Ambient air and water quality standards generally follow U.S. standards. TEPA developed a rigorous emissions or effluent standards-setting process and an equally rigorous monitoring and enforcement program. By 1991 TEPA had 184 ambient air quality—monitoring stations, which monitored for PM₁₀, SO₂, NO₂, CO, and O₃. Results from these stations are aggregated into individual indices that are then combined into an overall pollution standards index (PSI). TEPA now routinely reports the percent of days in a year or month when the PSI is below 100 (considered healthy), between 101 and 199 (considered unhealthy), and above 200 (considered very unhealthy). It also closely monitors the reliability of monitoring stations.

In 1989 two years after TEPA was formed, TEPA committed itself to meeting the country's ambient air quality standards by 2002. It screened more than 9,000 factories, and identified 24,343 different air pollution sources in those factories, 10,484 pieces of pollution control equipment, and 74,343 smokestacks. Following this survey, TEPA carried out random inspections, followed up with a Flying Eagle Project and a Rambo Project. Flying Eagle used police helicopters to respond to citizen complaints about factory emissions; Rambo was a “get tough” project that randomly rechecked state-owned and private factories that failed earlier inspections.

Several ambient indicators reveal significant, perhaps substantial, environmental progress. Following the first round of environmental regulation in the early 1980s, ambient concentrations of SO₂ and NO₂ in the air fell steeply. Implementation of a new policy requiring significant reductions in the sulfur content of heavy oil and diesel fuel in 1993 led to even further reductions in SO₂ concentrations. An equally precipitous decline has occurred in the percentage of days with a PSI index greater than 100. Chlorofluorocarbon (CFC) consumption has fallen sharply as well—by 86 percent—from 16,255 tons in 1988 to 2,304 tons in 1994.

What are the implications of these differing experiences among environmental agencies in our group of ten countries? Several are particularly important.

- a. These experiences demonstrate that several countries in this region have found it possible to sustain or improve environmental quality with rapid economic growth. This has contributed to declines or limited increases in the pollution intensity of industrial production.*

Singapore is the best example of how to do this in the early stage of industrial development. Evidence from the Malaysian palm oil industry suggests how this can be accomplished at an industry-specific level. There, palm oil production rose sevenfold, export earnings rose fivefold, whereas overall pollution loads declined by about 500 percent. Similarly, the recent experience in Taiwan suggests that much can be accomplished by a traditional command and control environmental agency in a relatively short period of time.

- b. Each of the successes were predicated on commitments by government elites, located outside what might be considered an environmental constituency, to build, support, and*

sustain tough environmental standards and equally tough enforcement in traditional command and control agencies.

Government elites appear to have made these commitments for a variety of reasons. In Singapore, Prime Minister Lee Kuan Yew decided to attack the country's environmental problems at an early stage of industrial development. In Malaysia the shift to better environmental policies followed serious public criticism of growing industrial pollution, particularly the highly visible pollution associated with palm oil production. In Taiwan, a combination of public pressure and intra-elite pressure finally brought the government around. Interestingly enough, similar developments are clearly visible in both Indonesia and Thailand. This bodes well for the future in these countries. This is less clear in India, Sri Lanka, and the Philippines, where governments and the public are distracted by what are viewed as more pressing problems.

c. Little is known about the cost-effectiveness of environmental actions in any of the study countries, including Singapore, Malaysia, or Taiwan.

For the most part, each of the environmental agencies in these countries are following traditional command and control approaches to regulation. Experience elsewhere suggests that as environmental quality improves, continuing reliance on command and control solutions becomes increasingly costly.

d. Even in the country with what might be termed the best and most effective command and control agency Singapore significant environmental problems remain. Chief among these is the handling, treatment, and disposal of toxic and hazardous wastes. This may be the one place where pollution intensities are rising.

As industrial structure has evolved in each country of the study group countries, this problem has become more acute. Projections by the World Bank's pollution projection project suggest that unless actions are taken now, the toxic intensity of production may rise in most countries.

e. It is important to note that in no country has urban environmental quality (or pollution intensity) improved without building, supporting, and sustaining a traditional command and control environmental agency or ministry.

This suggests that doing so may be a prerequisite for making industrial development more sustainable.

f. Experience in these countries suggests that two explicit and alternative paths exist for integrating environmental considerations into industrial policy.

The first path, reflected in Singapore's strategy, requires building a command and control environmental agency and making it a coequal partner with the other key institutions of industrial policy. This path relies less on fiscal and financial incentives offered by traditional industrial policy organizations. It also relies less on explicit clean production programs. The second path, evidenced by Taiwan, complements a command and control environmental program with strong fiscal and financial incentives in traditional industrial policy agencies. It also offers significant

support for research on clean production and for firms to reduce pollution intensity by minimizing wastes and adopting clean technologies.

4. How do public awareness and community pressures affect the pollution and resource intensiveness of industrial production?

Countries in Asia are experiencing a sea change in public attitudes toward the environment. Almost everywhere, pollution problems, particularly those in urban areas are regularly and increasingly reported in the print and visual media. Public opinion surveys reveal that growing middle classes are now demanding cleaner environments. And public environmental concern is being expressed to governing elites by respected leaders in nonprofit research institutes, universities, and other well-regarded NGOs.

Communities and NGOs are also actively organizing for a better environment. Scattered evidence suggests they are having some impact. NIMBY protests affect a variety of industrial activities nearly everywhere. NIMBY protests make siting new industrial plants almost impossible in Taiwan. This is increasingly true elsewhere. In India, DuPont was recently driven by civic opposition from locating in Goa. It subsequently located outside Madras but only after well-planned community relations work with local NGOs. Similarly, siting of hazardous waste and solid waste facilities have evoked vocal community opposition in Sri Lanka, Thailand, and Korea. Response to these pressures has sometimes delayed construction, but it has also encouraged many countries, such as Thailand, to develop on-site or industrial-estate disposal locations.

But NGO and community actions are not limited to NIMBY protests. In India, where monitoring and enforcement by the country's environmental agency is notoriously lax, NGOs have brought suits against polluters and the country's environmental ministry. The courts have for the most part backed these NGOs and taken on the task of enforcing the country's environmental regulations. In Korea, public exposure of the polluting behavior of several firms has led consumers to organize boycotts against the polluter's products. In at least one instance, an ingenious competitor used a competitor's poor environmental record to increase its market share of a popular product. Communities are also organizing to get polluters to reduce pollution.

Not surprisingly, environmental agencies are learning how to utilize public awareness and community pressures to improve environmental outcomes. Most commonly, environmental agencies conduct environmental campaigns, plant trees, and organize Earth Day celebrations. They also resolve nuisance complaints against polluters and engage in dispute resolution between communities and polluters. In at least one instance, an environmental agency, BAPEDAL in Indonesia, has integrated community pressures into its monitoring and enforcement program.

In 1994 BAPEDAL introduced an environmental business rating program, called the Program for Pollution Control, Evaluation, and Rating (PROPER). In PROPER, a polluter "volunteers" to have its environmental performance rated by BAPEDAL. After evaluation, BAPEDAL grades performance by assigning polluters one of five colors—black for factories making no effort to control pollution, red for factories with some pollution abatement but who fall short of compliance with emission standards, blue for factories whose environmental performance meets standards, green for factories whose emission control exceeds standards, and gold for those who are engaged in clean production.

Before ratings outcomes are released to the public, firms are given six months to improve performance. Following this, they are rated again and the results are publicly announced. Limited evidence suggests that this program has resulted in significant improvement in environmental performance of rated firms. Not surprisingly, interest in this program has spread beyond Indonesia. But this is not the only evidence to suggest that community pressures affect behavior of polluters. Several econometrics studies now show that differences in community pressures account for some of the significant differences observed in the polluting behavior of firms in the same industry in the same country.⁶

What are the implications of Asia's growing and increasingly sophisticated public awareness programs and organized community pressures?

- a. The educating role of the media in focusing attention on government and industry environmental failures has been increasingly significant, but access to information on industrial pollution issues, clean technology, and approaches to policy reform is constrained.*

Everywhere assessment teams went, it was clear that the media is reporting more regularly on the environment. For the most part, press coverage of environmental issues is both thorough and increasingly professional. But sometimes this reporting suffers from lack of access to information. More public disclosure can only help. Increased exposure to experiences in the United States with such programs as the USEPA's Toxic Release Inventory program could prove invaluable.

- b. But public action, public opinion, and community pressure by themselves are no guarantee of improved environmental performance. The corollary to this is that environmental improvement can take place without it.*

Two examples at opposite ends of the spectrum make this clear. Singapore has sustained a relatively clean environment with limited public action, community pressure, and public disclosure. On the other hand, India's free press, institution-rich NGO environment, and long history of local community activism have had little impact on environmental quality. What explains these differences?

In both instances, the answer is government policy toward the environment. In Singapore, the prime minister decided as early as 1969 that Singapore would grow but be environmentally clean. To that end, the country created a strong environmental ministry with good monitoring and tough enforcement powers. This was complemented by an equally strong land-use agency backed up with equally tough enforcement powers. Environmental outcomes in Singapore are a testimony to what can be done by a government committed to strong actions. These actions also appear to have minimized the need for public action, community pressure, and public disclosure. In contrast, India, which arguably has the world's largest NGO movement, including environmental NGOs, has seen its environment steadily deteriorate. Part of the reason for this is the focus of environmental NGOs on the "green" issues. Part of it also reflects the lack of influence communities and NGOs have on government on this issue. But the most important reason for this outcome is the lack of willingness and ability of the Indian government to clean up the environment.

- c. *When environmental agencies learn to work in concert with communities, much can be accomplished. They have another reason to do this. It economizes on scarce regulatory resources. This may also be leading to the emergence of a new pollution control paradigm.*

Environmental agencies in all but three or four of the ten countries studied are understaffed and underfinanced. They also lack sufficient political support to make them more credible. Because of this, standards setting, monitoring, and enforcement are all weak. This makes it difficult to assess compliance. It also encourages polluters to ignore regulators.

Some of these problems can be overcome if regulators learn to work with communities. BAPEDAL's environmental business rating program is the most notable but not the only example of this. Taiwan appears to have developed a highly successful nuisance action program whereby enforcement relies, at least partially and initially, on complaints from communities. This economizes on scarce monitoring resources. In Korea, the environmental ministry is experimenting with Japanese style dispute resolution procedures to handle community complaints against polluters.

These programs have several things in common: They economize in the use of scarce regulatory resources. They legitimize the role of communities in monitoring and enforcement. They involve the environmental agency as a facilitator in negotiations between polluters and consumers. Some have suggested that, taken together, this combination defines a new paradigm for controlling pollution.⁷

4. Implications of Assessment Findings for US-AEP

The country assessments revealed significant industry-environment interactions in the ten countries. Governments and private sectors are responding to new international environmental market pressures. Central economic ministries—planning agencies, ministries of industry, science and technology institutes, and national standards institutes—are increasingly investing in environmental programs. Environmental ministries are becoming stronger and NGOs and communities are organizing for a better environment. Taken together, these activities could well be the incubator for what US-AEP terms a “clean industrial revolution.” This provides US-AEP with a signal opportunity that should not be missed. But, at the moment, some of this activity is nascent, inchoate, and at least partially donor driven. This means that except for a few cases among the highest income NICs, no consistent policy framework is promoting a “clean industrial revolution.”

If US-AEP is to target its partnership programs successfully to promote cleaner industrial production, it is important to recognize that success will depend heavily on the development of an appropriate policy framework in each of the ten Asian countries. The suggestions below outline approaches that US-AEP might encourage to strengthen these frameworks.

1. ***Important differences across countries suggest the need to develop country-specific programs and to develop mechanisms for sharing country experiences.*** Because Taiwan and Singapore have well-developed industry and environment programs, emphasis there should focus on learning between the two countries and sharing lessons learned with others. Because interest is high and programs are less well-developed in Thailand, Malaysia, Indonesia, and Korea, this group of countries provides a key opportunity for significant US-AEP partnership development. US-AEP should consider focusing its resources on these countries. Because interest is significantly lower in India, Hong Kong, the Philippines, and Sri Lanka, US-AEP work there might emphasize sharing what has been learned elsewhere in Asia.
2. ***This keen interest in reducing the pollution intensity of production provides ample opportunity for developing policy analysis and information networks and for sharing experiences, particularly among the ten countries and between the ten countries and the United States.***

It would be highly worthwhile for US-AEP to fund a series of collaborative Asian and Asian-American partnership networks. Potentially noteworthy candidates include the following:

- a. ***An Asia region network that provides opportunities for individuals in institutions of industrial policy planning agencies, ministries of industry, science and technology institutes, and standards agencies to share experiences and develop, where appropriate, regional action plans to solve common problems.***

The network might include, for example, representatives from EDB in Singapore, the Malaysia Industrial Development Authority (MIDA), the Ministry of Finance and Economics (MOFE) in Korea, IDB in Taiwan, and the Ministries of Industry and Trade in Indonesia and Thailand.

Among other things, representatives from these organizations could share their experiences with incentive programs to reduce pollution intensity. Alternatively, it might make sense to establish a clean production network that involves universities and science and technology institutes such as ITRI in Taiwan, Singapore Institute of Standards and Industrial Research (SISER), Standards and Industrial Research Institute of Malaysia (SIRIM), and KAITECH. This program might also be productively linked with the U.S. National Academy of Engineering.

b. A policy analysis partnership network of Asian and American academics, research institutes, and government organizations that examines alternative incentives for promoting a clean industrial revolution.

Individuals and organizations in the network would conduct, publish, and disseminate studies; hold workshops and conferences; engage in policy dialogue; and produce an annual flagship publication that includes indicators of progress. The network should include collaboration with the World Bank and the Asian Development Bank.

c. A regional industry and environment working group.

The purpose of this working group of industrial and NGO representatives would be to address regional problems through the partnership mechanisms that US-AEP has fostered. These might include a common action agenda for ISO 14000 or a common environmental code of conduct for foreign investors, particularly those with poor environmental records.

3. A wide range of incentive programs in these countries are designed to reduce the pollution-intensity and resource-use intensity of industrial production. But little is known about whether these programs work or whether they are cost-effective.

Because these industry incentive programs are important to US-AEP, the Secretariat should support the analysis of a selected number of these programs to determine whether or not they are or can be made cost-effective. Potential candidates for study include Taiwan's environmental goods and services export promotion program; Singapore's water-saving program; Korea's, Thailand's, and Indonesia's clean production programs; and Korea's Environmentally Friendly Companies Act. These policy studies provide an opportunity for building a partnership network of analysts in industry and environment policy studies in the ten countries.

4. Because US-AEP is working in largely uncharted territory, it is extremely important that the Secretariat of US-AEP have in-house analytic and policy capacity.

The proposed virtual policy center could well fill this role. The testing of assumptions, analysis of relevant U.S. and selected Asian experience for application to other places in Asia, and ability to stay current with rapidly evolving developments in Asia, America, and Europe will be critical to progress in this complex arena. Given the reputation of US-AEP for pioneering change, unless this capability is developed, it will fail to realize the opportunities and challenges it faces, which would be a tragedy.

Endnotes

1. The high-performing economies include South Korea, Taiwan, Hong Kong, Singapore, Indonesia, Malaysia, and Thailand.
2. US-AEP is a large environmental trade and technology promotion program that is sponsored by multiple U.S. agencies and operates in ten countries in Asia. The program emphasizes doing well (promoting U.S. environmental technology and services exports) by doing good (helping ten countries in Asia to reduce the pollution intensity and resource-use intensity of industrial production). The Secretariat of US-AEP terms this strategy one that “fosters a clean industrial production revolution” in Asia.
3. On the role of publicly provided information in environmental policy, see Kennedy (1994).
4. This happens, for example, when multinational corporations impose environmental specifications on their suppliers.
5. In 1992 domestic production of the environmental goods and services industry equaled \$1.3 billion dollars. Of this, 6 percent (\$75 million) was exported. Production is expected to grow at an annual average rate of 11 percent through 2002. In that year, domestic production will equal \$3.75 billion, of which \$464 million is expected to be exports (14 percent) (Industrial Development Bureau, n.d. Table entitled “Status and Target of Environmental Protection Industry”).
6. In addition to Hettige, Huq, Pargal, and Wheeler, see Blackman and Bannister 1996.
7. Afsah, Laplante, and Wheeler (1996).

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